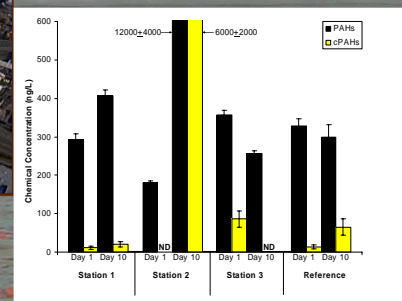
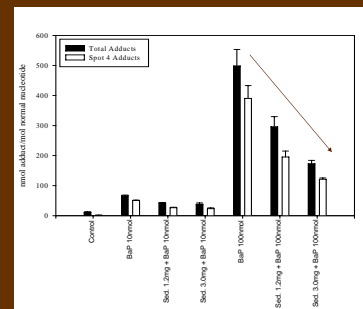
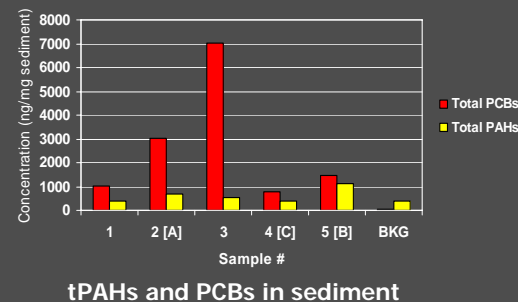


# In situ Studies of Sediment Toxicity at Superfund Sites: Using Biomarkers of Exposure in Coho Salmon to Evaluate complex Mixtures of PCBs and PAHs

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**Abstract:** Contaminated sediments represent a significant challenge for risk characterization and remediation. Bioavailability, as well as ecological and human risk assessment, are all important issues for contaminated sediments. In collaboration with scientists from the US EPA region 10, Texas A&M University has conducted several *in situ* studies to measure uptake and toxicity in coho salmon. The studies have been conducted on an industrial waterway in the northwest United States. Records for this site indicate that the waterway is contaminated with polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) in several locations. Based on existing data, three stations were selected for study in contaminated regions of the river, and one reference station was selected in an area known to be comparatively free of contamination. Water column and sediment samples were collected to measure contaminant concentrations. In addition, two wire mesh cages, each containing 10–12 coho salmon fingerlings, were placed at each station for approximately seven days. Total PAHs in sediment based on dry weight ranged from 2,700 mg/kg to 5,100 mg/kg at the contaminated stations and 8,025 mg/kg at the reference station. PCBs were not detected in the sediment from the reference station, while PCB concentrations in sediment from the contaminated areas ranged from 399 mg/kg to 7,800 mg/kg. Carcinogenic PAHs in fish tissue from the reference station averaged 1.1 ng/g wet weight, while carcinogenic PAHs in fish tissue from the contaminated stations ranged from 0.9 ng/g wet weight to 1.7 ng/g wet weight. Although DNA adducts were detected in fish tissues, there was no correlation between adduct levels and contaminant concentration. Additional studies are planned to investigate other biomarkers of exposure that may be more sensitive to the PCBs.

**Methods:** Data were collected from 5 stations within a contaminated zone, and a reference station on an industrialized waterway in the Pacific Northwest. Water column and sediment samples were collected, extracted and analyzed using standard procedures. In addition, Coho Salmon fingerlings (provided by the NOAA) were placed in cages and positioned at each sampling station for one week. Following the one week exposure, fish were euthanized and tissues collected for genotoxicity and chemical analysis. The genotoxicity of selected sediment extracts was also measured *in vivo* using the 32P-postlabelling method.



PAHs and carcinogenic PAHs (cPAHs) detected in water samples collected during Day 1 of fish cage placement and Day 10 of fish cage retrieval (N=3 on each day at each station) in July 2004. Statistical interval = SE.

**Conclusions:**  
 Concentrations of PAHs & PCBs in water and sediment did not correlate with tissue concentrations in Salmon; Sediment extracts inhibited BAP genotoxicity *in vitro*; Future studies will measure EROD induction.

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